ABSTRACT

A new class of algorithms has been developed to estimate spectral reflectance in remote sensing imagery. These algorithms are called Surface Prior Information Reflectance Estimation (SPIRE) algorithms and estimate surface spectral reflectance using prior spatial and spectral information about the surface reflectance. This paper describes SPIRE algorithms that employ spatial processing of single channel data to estimate local changes in spectral reflectance under spatially and spectrally varying multiplicative and additive noise caused by variations in illumination and atmospheric effects. Rather than modeling the physics of the atmosphere and illumination (using a physics-based code such as ATREM), or using ground truth spectra at known locations to compensate for these effects (using the Empirical Line Method), prior information about the low spatial frequency content of the scene in each spectral channel is used instead. HYDICE VNIR-SWIR hyperspectral data were used to compare the performance of SPIRE, ATREM, and ELM atmospheric compensation algorithms. The Spatial SPIRE algorithm performance was found to be nearly identical to the ELM ground-truth based results, while Spatial SPIRE performed better than ATREM overall, and significantly better under high clouds and haze.